U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

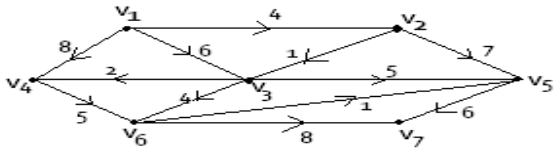
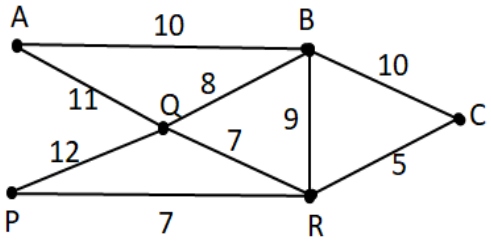
Autonomous Institute Affiliated to VTU

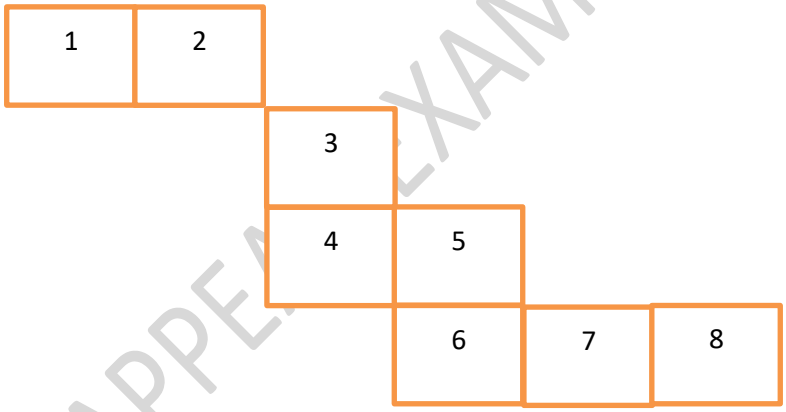
June 2025 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: CSE/ISE **Duration: 3 hrs.**
Course Code: 22MA3BSSDM **Max Marks: 100**
Course: STATISTICS AND DISCRETE MATHEMATICS

Instructions: 1. All questions have internal choices.
2. Missing data, if any, may be suitably assumed.
3. Use of Statistical tables is permitted.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - 1	*CO*	*PO*	Marks
1	a)	Determine $\|V\|$ for the following graph G (i) G has 9 edges and all vertices have degree 3 (ii) G has 10 edges with 2 vertices of degree 4 and all other of degree 3.	*1*	*1*	**6**
	b)	Define Isomorphism of graphs. Verify that the given two graphs are isomorphic or not. 	*1*	*1*	**7**
	c)	Apply Dijkstra's algorithm to find the shortest path and its weight from vertex v_1 to vertex v_5 from the weighted, directed network shown below. 	*1*	*1*	**7**
		OR			
2	a)	Apply Kruskal's algorithm to find a minimal spanning for the weighted graph shown below. 	*1*	*1*	**6**

		b)	Draw the graph of the following adjacency matrix and hence write its incidence matrix. $A(G)=\begin{bmatrix}0&1&0&1&0&1\\1&0&1&0&1&0\\0&1&0&1&0&1\\1&0&1&0&1&0\\0&1&0&1&0&1\\1&0&1&0&1&0\end{bmatrix}$	*1*	*1*	**7**
		c)	Let G be a simple graph with n vertices and m edges where m is at least 3. If $m \geq \frac{1}{2}(n-1)(n-2)+2$, prove that G is Hamiltonian.	*1*	*1*	**7**
			UNIT - 2			
	3	a)	A survey of 500 television viewers of a sports channel produced the following information. 285 watch crickets, 195 watch Hockey, 115 watch football, 45 watch cricket and football, 70 watch cricket and hockey, 50 watch hockey and football and 50 do not watch any of the three kinds of games. How many viewers in the survey watch (i) All the three games and (ii) Watch exactly one of the sports.	*1*	*1*	**6**
		b)	Obtain the rook polynomial for the following chess board. 	*1*	*1*	**7**
		c)	Find the generating function for each of the following. (*i*) $1^2, 2^2, 3^2, ---$ and (*ii*) $0^2, 1^2, 2^2, 3^2, ---$.	*1*	*1*	**7**
			OR			
	4	a)	Define Catalan number. Hence, find in how many ways can one move from the point (3,8) to the point (11,16) in the $x-y$ plane by using only the R and U moves and without crossing the line $y=x+5$.	*1*	*1*	**6**
		b)	Find the coefficient of x^{27} in the expansion of the following functions. *(i)* $\left[x^4+x^5+x^6+---\right]^5$ *(ii)* $\left[x^4+2x^5+3x^6+---\right]^5$	*1*	*1*	**7**
		c)	For the positive integers 1, 2, 3,…,n there are 11660 derangements where 1,2,3,4,5 appear in the first five positions. What is the value of 'n'?	*1*	*1*	**7**

			UNIT - 3			
5	a)	Fit a second-degree parabola $y = ax^2 + bx + c$ in the least square sense for the following data and hence estimate y at $x=6$. x: 1, 2, 3, 4, 5 y: 10, 12, 13, 16, 19	*1*	*1*	**6**
	b)	The probability that a news reader commits no mistake in reading the news is e^{-3} . Find the probability that on a particular news broadcast he commits (i) Only 2 mistakes (ii) More than 3 mistakes (iii) At most 3 mistakes.	*1*	*1*	**7**
	c)	If x is an exponential variate with mean 3 find *i)P (x > 1)* and *(ii) P (x < 3).*	*1*	*1*	**7**
		OR			
6	a)	Obtain the lines of regression and hence find the coefficient of correlation for the data x: 1, 2, 3, 4, 5, 6, 7 y: 9, 8, 10, 12, 11, 13, 14	*1*	*1*	**6**
	b)	In a test on electric bulbs, it was found that the life time of a particular brand was distributed normally with an average life of 2000(*hrs)* and standard deviation of 60(*hrs)*. If a firm purchases 2500 bulbs find the number of bulbs that are likely to last for (i) More than 2100(*hrs)* (ii) Less than 1950(*hrs)* (iii) Between 1900 to 2100(*hrs).*	*1*	*1*	**7**
	c)	*8x - 10y + 66 = 0; 40x - 18y = 214* are two regression lines. Find the mean of *x's, y's* and correlation coefficient. Find σ_y *if* $\sigma_x = 3$.	*1*	*1*	**7**
		UNIT - 4			
7	a)	The blood pressure (B.P.) of 5 women before and after intake of a certain drug are given below: Before: 110, 120, 125, 132, 125 After: 120, 118, 125, 136, 121 Test at 1% level of significance whether there is significant change in B.P.	*1*	*1*	**6**
	b)	A sample of 100 bulbs produced by a company A showed a mean life of 1190hrs and a standard deviation of 90hrs. Also, a sample of 75 bulbs produced by a company B showed a mean life of 1230hrs and a standard deviation of 120 hrs. Is there a difference between the mean life time of the bulbs produced by the two companies at 5% level of significance?	*1*	*1*	**7**
	c)	A sample analysis of examination results of 500 students was made. It was found that 220 students had failed, 170 had secured third class, 90 had secured second class and 20 had secured first class. Do these figures support the general examination result which is in the ratio 4:3:2:1 for the respective categories?	*1*	*1*	**7**

			OR			
	8	a)	A pharmaceutical firm claims that the mean time for a drug to take effect is 24 minutes. In a sample of 400 trials, the mean time is 26 minutes with a standard deviation of 4 minutes. Test if the mean time for a drug to be effective is significant?	*1*	*1*	**6**
		b)	A group of 5 patients treated with medicine "A" weigh 42, 39, 48, 60, and 41 kgs. A second group of 7 patients from the same hospital treated with medicine "B" weigh 38, 42, 56, 64, 68, 69 and 62 kgs. Do you agree with the claim that the medicine "B" increases the weight significantly at 5% level of significance?	*1*	*1*	**7**
		c)	Two random samples drawn from two normal population are *Sample1* 20 16 26 27 22 23 18 24 19 25 - *Sample2* 27 33 42 35 32 34 38 28 41 43 30.3 Obtain the estimates of variance of the population and test at 5% level of significance whether two populations have the same variance.	*1*	*1*	**7**
			UNIT - 5			
	9	a)	Solve the linear congruence $12x \equiv 6(mod\ 21)$.	*1*	*1*	**6**
		b)	Applying Euler's theorem, find the last two digits of 11^{84}.	*1*	*1*	**7**
		c)	Solve $x^3 + 4x \equiv 4(\text{mod } 343)$.	*1*	*1*	**7**
			OR			
	10	a)	Apply Chinese remainder theorem to solve the system of congruences $x \equiv 5(mod\ 3);\quad x \equiv 2(mod\ 5);\quad x \equiv 1(mod\ 11)$.	*1*	*1*	**6**
		b)	i) Applying Fermat's Little theorem, show that $8^{30} - 1$ is divisible by 31. ii) Apply Wilson's theorem to find the remainder of *67!* when divided by *7.*	*1*	*1*	**7**
		c)	Solve the linear congruence $5x \equiv 1(\text{mod } 4)$.	*1*	*1*	**7**

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